A

SYNOPSIS ENTITLED

STUDIES ON BIOCONTROL ACTIVITY OF MEDICINAL PLANTS AGAINST PATHOGENS OF PULSES

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SUBMITTED BY

Ms. PATIL MINAXI VINAYAKRAO
M. Sc BOTANY

RESEARCH STUDENT

UNDER THE GUIDANCE OF

Dr. RAJKUMAR GUNDAJIRAO BIRADAR
Assistant Professor

DEPARTMENT OF BOTANY
SAMBHAJIRAO KENDRE MAHAVIDYALAYA,
JALKOT. DIST: LATUR

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FORMAT FOR SUBMISSION OF Ph.D. SYNOPSIS WORK PLAN FOR FACULTY OF SCIENCE

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1. INTRODUCTION:

India is the largest producer and consumer of pulses in the world. Increase in agricultural production is the key to overall economic growth. In view of increasing world population and escalating overall food requirements, rapid growth of agriculture is essential for ensuring food security and alleviating poverty. Growing demand must be met primarily by increasing the production from existing land which is already under cultivation and by reducing losses due to diseases and pests.

The poor productivity of pulses in India is attributed primarily to poor spread of improved varieties and technologies, untimely and inadequate availability of quality seed of improved varieties.

Pulses can adapt to a wide range of edaphic and climatic conditions and therefore can constitute an important component of climate change mitigation and adaptation strategy.

Seeds of pulses constitute the main propagule for plant growth and at the same time, one of the main vehicles for the dissemination of plant pests. Seed borne pathogens, such as fungi, bacteria and viruses are serious constraints to crop productivity. Besides, increasing crop productivity seed health issues are extremely important in international seed trade and conservation and utilization of plant genetic resources, which is vital for global food security.

The top ten pulses producing States in India are Rajasthan, Madhya Pradesh, Maharashtra, Uttar Pradesh, Karnataka, Andhra Pradesh, Gujrat, Jharkhand, Tamil Nadu and Telangana.

India is the largest pulses producer globally accounting for 27 - 28% of the world's total production. Pulses are important, both as human and animal food. They also improve soil health. As yet, there has been no major breakthrough in the productivity of these crops. Pulses contains more proteins than any other vegetables. The seeds of pulses contain 20 to 25% proteins which is double the protein content of wheat and three times that of rice. Pulses also contain carbohydrates, fats, minerals and vitamin B. Pulses play a key role in crop rotation due their ability to fix nitrogen. Pulses provide significant nutritional and health benefits, and are known to reduce several non-communicable diseases such as colon cancer and cardiovascular diseases (Yude et al, 1993; Jukanti et al, 2012).

Nutritive value of Pulse

Constituents	Magnitudes
Protein	>20-%
Carbohydrate	55 – 60%
Fat	>1.0%
Fiber	3.2%
Phosphorus	300-500 mg/100 g
Iron	7-10mg/100 g
Vitamin C	10-15 mg/100 g
Calcium	69 -75mg/100g
Calorific value	343
Vitamin A	430-489 IU

According to Ministry of Agriculture and Farmar Welfare posted a post on 3rd August 2021 by PIB Delhi, the production of pulses has been increasing during three years. For increasing the production of pulses, NFSM - pulses program is being implemented in 644 districts of 28 states and UTs of Jammu and Kashmir and Ladakh.

Pulses.	Target during. 2020 - 21. in LMT	Target during 2021 – 22 in LMT
Tur	10	10
Urad.	04	04
Chana	03	06
Moong	01	01
Masoor	1.5	02
Total pulses.	19.5	23

The second advance estimates of the production volume of the pulse gram amounted to around Four million metric tones in the financial year 2023. Meanwhile tur had around 4 million metric tones produced the same year. Gram was the highest produced pulse in India during that time.

In Karnataka 21,55890 tones pulses produced annually 2021 - 22. The southern states grow 9.36 % of India's pulses. India is the world's largest producer (25 % of global production) a buyer with 27% of global consumption and an importer with 14% of the global trade of pulses.
India is the largest producer, importer and consumer of pulses in the world, accounting for nearly 25 % global production. 15 % of international trade and 27% of world consumption.

India has to produce not only enough pulses but also remain competitive to protect the indigenous pulse production. In view of this, India has to develop and adopt more efficient crop production technologies to fight against seed borne pathogens.

Seed borne pathogens are transmitted by three different ways.

1. External Pathogens (Seed Borne): The inoculums in such cases is superficial and confined to the surface of the seed, usually the pathogen commonly borne on the surface of the seed include species of *Alternaria, Fusarium, Helminthosporium*, many smut and rust fungi as well as many other, contamination of the seed surface.

2. Internal Pathogens (Seed Borne): The inoculums likes within the tissue i.e. these are carried inside the seed.

3. Concomitant Contamination: The inoculum is present as concomitant contamination mixed with seeds in the form of infected plant debris, etc. The pathogen carried through the seed has a very good chance of being transmitted to the next generation. When a seed is infected it is reasonable to assume that the particular cultivar is susceptible to the pathogen involved. The intimate association of the host and parasite in the seed both in time and space provide maximum opportunities for progeny infection. This is particularly true of the pathogens that infect the embryo.

Biological control is one of the viable, eco friendly propositions, which can substantially minimize the disease (Ashwini and Giri 2014). The use of biologically based compounds in plant extracts may be an alternative to currently used fungicides to control phytopathogenic fungi, because they virtually constitute a rich source of bioactive chemicals such as phenols, flavonoids, quinons, tannins, alkaloids, saponins and sterols (Burt, 2004). The biological control is the use of organisms for the control of microorganisms, reducing the amount of inoculums that determines the extent of disease. Biological seed treatment is usually very specialized and uses specific

microorganisms that attack or interfere with specific pathogens or types of pathogens. The biological seed treatment involves the use of biological organisms to control the pathogen located in the seed. The induction of resistance promotes the activation of the latent plant defense systems, which manifests itself when it comes into contact with a biotic or abiotic elicitor. The expression "resistance of induction" both can be used to denote local protection, the induction of a resistance only in the tissues in which it was applied the treatment with the inducing agent, also can indicate a systemic resistance that manifest far from the tissue where the elicitor was applied (Stangarlin et al. 2011).

Today, medicinal plant extracts have been accorded a lot of importance for crop protection against pest and disease due to their target specificity and safety. With the high rate of fungal resistance to antifungals, there is a need to develop alternative antifungals, that are effective, efficient and safe to use and that would protect crop and yield quality. Plant extracts and products have been observed to be effective against a large number of pathogens (Rathod et al., 2012).

Hence, present investigation was carried out to know the causes of infection, interaction between seeds and seed borne pathogens and its integrated management by fungicides and plant extracts. The current study of seed borne fungi of seed evaluates the use of medicinal plant extracts on some selected Pulses seed quality to identify potential enhancing properties.

2. REVIEW OF LITERATURE:

Biological control of Seed borne pathogens by Plant extracts:

Verma et al. (2000) studied antifungal activity of some Euphorbiaceous plants. Kamble and Bhale (2001) observed antifungal activity of plant extracts against *Fusarium udum* the incitant of Pigeon pea wilt.

Kiran and Raveesha (2002) observed antifungal activity of *Psoralea corylifolia* against important phytopathogenic species of *fusarium* and *Aspergillus*.

Javed and Charaya (2003) studied efficacy of leaf extract of certain plants against *Colletotrichum capsici.*

Kulkarni et al. (2004) evaluated botanicals and biocontrol agents against *Alternaria alternata.*

Pandey et al. (2004) studied integrated disease management of vegetable nursery.

Bhale et al. (2005) studied effect of plant extract on growth and spore germination in *Fusarium oxysporum f. spinaciae* causing wilt of Spinach.

Piyali Guha et al. (2005) studied antifungal activity of the crude extracts and extracted phenols from gametophyte and sporophytes of two species of *Adiantum*

Satish et al. (2007). Antifungal activity of some plant extracts against important seed borne pathogens of *Aspergillus* sp. He observed that among fifty-two plants tested, aqueous extract of *Acacia nilotica, Achras zapota, Datura stramonium, Emblica officinalis, Eucalyptus globules, Lawsonia inermis, Mimusops elengi, Peltophorum pterocarpum, Polyalthia longifolia, Prosopis juliflora, Punica granatum* and *Sygigium cumini* have recorded significant antifungal activity against one or the other *Aspergillus* species tested.

Beebi and Rasheed (2008) suggested bioefficacy of aqueous bulb extract of Garlic and *Bacillus amyxoliguefaciens* against seed borne fungi of Okra.

Deepak et al. (2008) revealed antifungal activity of some medicinal plants against *Fusarium oxysporum*.

Dhavle et al. (2008) observed effect of leaf extracts of *Datura Stromonium* on growth of *Colletotrichum capsici*.

Dhavle et al. (2009) studied utilization of *Allium cepa* leaf extracts on liner growth of *Collectotrichum capsici*.

Masum et al. (2009) studied Effect of seed treatment practices in controlling of seed-borne fungi in sorghum. Vitavax-200 gave the best result in controlling seed-borne infection of all the individual target pathogenic fungi followed by garlic tablet, hot water treatment and neem leaf extract.

Wadikar et al. (2009) studied effect of leaf extracts of *Nerium indicum* and *Hyptis suaveolens* on the growth of *Fusarium oxysporum* and *Sclerotium rolfsii* of Chickpea.

Rathod et al. (2010) studied utilization of medicinal plants to control seed borne pathogens of selected legumes seeds. The different leaf extract were used by them like *Azadirachta indica* A. Juss., *Ocimum sanctum* L., *Polyalthia longifolia* (Sonner.) Thw, *Tridax procumbens* L., *Catharanthus roseus* (L.) G. Don., *Vitex negundo* L. Among these *Azadirachta indica* A. Juss. was found more effective than other plants.

Zacharia and Philip (2010) discussed biological control of post harvest diseases of brinjal.

Fayadh and Aledani (2011) accessed the effect of some microelements and biological control agents in control of tomato seedling damping-off caused by *Rhizoctonia Solani* kuhn. The results showed that biological control agent (*Trichoderma harzianum* ; *Bacillus subtilis*) have a high antagonistic ability in inhibition the growth of *R.solani*.

Kakde et al. (2011) studied fungitoxic properties of leaf extract and latex against storage fungi. He observed that aqueous extract of *Eucalyptus angophoroides* retarded the growth of *Alternaria dianthicola,Curvularia pellescens, Fusarium oxysporum, Macrophomina phaseolina, Rhizopus stolonifer, Penicillium digitatum* and *Penicillium chrysogenum.* The latex of *Calotropis gigantia* for *Alternaria dianticola*; *Aloe vera* for *Curvularia lunata* and *Penicillium digitatum* were found to be fungitoxic.

Kuri et al. (2011) observed the antifungal potentiality of some botanical extracts against important seedborne fungal pathogen associated with Brinjal seed. He reported that the brinjal seeds treated with leaf extract of *M. oleifera* showed high percentage of seed germination (92%). The treated seeds with leaf extract of *C. procera, Clerodendron* spp, *S. alata,T. orientales, C. spasriflorous*, seed extract of *P. roxburghii*, leaf extract of *L. camara* and Vitavax 200 showed over 80% seed germination.

Shinde et al. (2011) studied the utilization of medicinal plants to control the seed borne pathogens of selected seeds.

Swaminathan and Nandhakumar (2011) discussed traditional knowledge in vrkshayurveda with crops like green gram, onion, sorghum, maize, black gram, cow pea and bhendi

Debnath et al. (2012) investigated effect of seed-borne fungi on the germinating seeds and their bio-control in maize. They analysed efficacy of biocontrol means (BAU-Biofungicide, Garlic extract and Neem extract) in controlling seedborne fungal diseases of maize (*Zea mays*). The identified fungi associated with the seeds were *A. niger, A. flavus, Fusarium sp., P. oxalicum, C. lunata* and *R. stolonifer*. The seed samples were treated with BAU- biofungicide @ 2.5% of seed weight, neem extract@ 1:2 w/v and 1:3 w/v and garlic extract @ 1:2 w/v and 1:3 w/v to control the seed-borne pathogens. The effective results were recorded as regards to the highest germination (84.5%) reflected the lowest disease incidence (4.0%) recorded in BAU Biofungicide treated seeds followed by other treatment.

Islam and Faruq (2012) studied effect of Some Medicinal Plant Extracts on Damping-off Disease of Winter Vegetable. They found that, Neem leaf extracts showed the best effect on reducing damping-off and increasing germination as well as growth characters of vegetable seedling. Garlic clove extract and allamonda leaf extract showed the better result followed by neem leaf.

Rathod and Pawar (2012) studied antimicrobial activity of medicinal plant to control seed borne pathogen of soybean. Leaf extracts of plants like, *Azadirachta indica A.Juss., Acacia nilotica (L.) Del., Datura stramonium L., Polyalthia longifolia (Sooner.) Thw., Allium sativum L.* and *Annona squamosa.* were used by them for treatment of seeds. They reported that, *Polyalthia longifolia Thw., Allium sativum L.* and *Azadirachta indica A. Juss.* were more effective than other plants.

Rathod L. R., Jadhav M. D., Pawar P.V. and Muley S. M. (2012) studied ecofriendly activity of medicinal plant to control seed borne pathogens of groundnut. They reported that *Azadirachta indica* A. Juss. was found more effective than other plants.

Survase D.M. (2012) studied the effect of medicinal plants leaf extract on the seed mycoflora, seedling emergence and growth of seed borne fungi of methi. He reported that the leaf extract of *Semecarpus ancardium* (88%), *Solanum xanthocarpum* (79%), *Abrus precatorius* (81%), *Aegle marmelos* (84%), were found to be more inhibitory for incidence of seed mycoflora and more stimulatory for the seed germination and seedling emergence of methi.

Abd El-Rahim et al. (2013) accessed effectiveness of some plant extracts against *Fusarium spp.* causing cotton seedlings damping-off and found that clove and garlic extracts were successfully effective in suppressing the Fusarium growth *in vitro*.

Ahmed et al. (2013) studied efficacy of different plant extract on reducing seed borne infection and increasing germination of rice seed sample. He used five different plants extracts viz. garlic, allamanda, neem, chirata and bishkatali with two dilutions (1:1 & 1:2) for seed treatment. He concluded that among the five plant extracts with two dilutions (1:1 & 1:2), garlic (1:1) is most effective in controlling seed-borne fungal flora of rice followed by neem (1:1) and chirata (1:1) extract.

Choudhari et al. (2013) observed efficacy of different fungicides, biocides and botanical extract seed treatment for controlling seed-borne *colletotrichum sp.* in chilli.

Dhole et al. (2013) observed Allelopathic effect of aqueous and ethanolic extracts of some commonweeds on seed health of *Triticum aestivum* L. (Wheat). The result observed that the aqueous leaf extract of *Euphorbia hirta* L. showed highly reduced seed mycoflora and stimulatory for seed germination, seedling emergence, root length and shoot length as compared to the other weed plant extract and control. It is followed by *Portulaca oleracea* L. (root, stem and leaf extracts). The medium effect observed in extract of *Alternanthera sessilis* (L.) R.Br,ex DC and

mínimum result were observad in both root extracts of *Cyperus rotundus* L. The aqueous root, stem and leaf extracts of *Amaranthus tricolor* L. and *Cardiospermum helicacabum* L. showed bad effect on seed health.

Najat Marraiki. (2013) investigated the Effect of Aqueous Medicinal Leaf Extracts on Tomato Seed Quality. The study found that seed treatment with *Ocimum basilicum* showed greater root and shoot lengths than both the control and tomato seeds treated with *Artemisia Absinthium*. Also, *Ocimum basilicum* inhibited seed germination and vigour more than *Artemisia Absinthium*.

Lakshmeesha et al. (2013) observed antifungal activity of some medicinal plants on Soybean seed-borne *Macrophomina phaseolina*.

Swami C S and Alane S K. (2013) analysed the efficacy of some botanicals against seed - borne fungi of green gram (*phaseolus aureus* roxb.) and reported that these plant extracts found to be antifungal and can be used in control of the fungi associated with green gram.

Estimated production volume of pulses in India fy 2023 by type published by A. MINHAS Mar 22.2023.

3. OBJECTIVES OF RESEARCH:

The prospective seed health management (SHM) for Indian farmers is very cheap and useful. Seed health management by bicontrol agents has received tremendous success in developed nation and would certainly hold ground in India (Shrivastava, 1996).

Therefore, this investigation will be useful in increasing productivity as well as inducing early emergence of seedling with following objectives:

1. To isolate and identify fungi associated with pulse seeds.
2. To study the effect of seed exudates on spore germination of dominant seed borne fungi.
3. To study seed health of pulses effected by dominant fungi.
4. To study biological control of seed borne pathogens by plant extracts.
5. To know the chemical composition of plant extracts.

Hypothesis:

- The use of less chemicals to control and manage diseases.
- More use of biological control methods which will help to manage disease as wellas increase the fertility of soil and production also increased

4. MATERIALS AND METHODS:

A] Mycoflora of Pulses seeds and its assessment:

1. Collection of seed samples and detection of Seed Mycoflora

For the present study seed samples of three Plulses seeds *viz.* Black gram, Green gram, and Peogen pea will be collected from market of Bidar. Pulses seed samples collected from local market of Bhalki town will be considered as treated seed samples and samples collected from farmers will be considered as untreated seed samples.

The seed mycoflora would be isolated by using different methods such as Standard blotter paper method, Agar plate method and Seed washates as recommended by International Seed Testing Association ISTA (1966), De Tempe (1970), Neergaard (1973) and Agrawal (1976) at our research center PG department of Botany, Shivaji Mahavidyalaya, Udgir.

Observations will be recorded in percent incidence of seed borne fungi associated with unsterilized seeds. The fungi which appeared on seed would be isolated in pure culture for identification and for further study.

B) Seed Health Testing:

C) Biological control of seed borne pathogens:

Plant extracts

Medicinal plants have been used as a source of medicine from ancient times. The widespread use of herbal remedies and healthcare preparation are described in ancient text, such as the Vedas and Bible. These are obtained from commonly used traditional herbs and medicinal plants and have been traced to the occurrence of natural products with medicinal properties.

The plants selected for further study will be *Acacia nilotica*., *Aegal momelos, Aloe vera*., *Eucalyptus globules, Moringa oleifera, Tamarindus indica, Mimosa pudica, Achyranthus aspera, Abutilon indicum, Caesalpinia bunducella, Hemidesmus indicus, Tinospora cordifolia, Tridex procumbens, Vitex nigunda, Piper betel, Withania somnifera, Gymnema sylvestre, Ocimum sanctum, Colocasia esculenta, Pongamia pinnata,* etc.

Statistical analysis :

The statistical analysis of the obtained data will be carried out by using the standerd methods given by Panse, Sukhatme (1967) and Mungikar (1997).

5.SIGNIFICANCE

In view to increase the production and productivity of pulses to make the country self reliant in this vital sector, and also to provide flexibility to the States in implementation based on regionally differentiated approach, to promote crop diversification and to provide focused approach to the programmes, National Pulses Development Programme (NPDP) and Accelerated Maize Development Programme (AMDP) were merged into a Centrally Sponsored Integrated Scheme of Pulses and Maize, which was under implementation from 1.4.2004 to 31.3.2014 by Agriculture Department, Government of India. The Pulses component of ISPM was merged with National Food Security Mission (NFSM) w.e.f.1.4.2010. (Report on outcome budjet 2015-16, Ministry of Agriculture, Dept. of Agriculture and Corporation, Government of India.)

Treatment of pluses seeds has been shown to prevent plant disease epidemics caused by seedborne fungal pathogens. Furthermore, seed treatments can be useful in reducing the amounts of pesticides required to manage a disease, because effective seed treatments can eliminate the need for foliar application of fungicides later in the season. Although the application of fungicides is almost always effective, their non-target environmental impact and the development of pathogen resistance have led to the search for alternative methods, especially in the past few years. Physical treatments that have already been used in the past and treatments with biopesticides, such as plant extracts, natural compounds and biocontrol agents, have proved to be effective in controlling seedborne pathogens. These have been applied alone or in combination, and they are widely used owing to their broad spectrum in terms of disease control and production yield. In this work, the effectiveness of different seed treatments against the main seedborne pathogens of some important Pulses crops would be critically studied.

Significance of the study:

1. Sustainable production of pulses.
2. Management of seed borne fungi of pulses.
3. Overcoming the use of conventional fungicides.
4. Attaining the biocontrol by phytoextracts of pulses fungi.
5. Isolation and identification of seed borne fungi of pulses.
6. Study of pathogenicity of fungi with pulses.

YEAR-WISE WORK PLAN

I year: - Isolation of seedborne myoco-flora from selected Pulses seeds will be carried out. Slides preparation and scanning would be done as described earlier workers. Also seed health testing of Pulses seeds due to fungal attack will be accessed. Collection of literature on the concern research work will be carried out.

II year :- In this year effectiveness of medicinal plants on fungal pathogens will be measured. Reference collection would be done as required extent.

III year:- Assembling of the data obtained as a result of the previous experiment will be done. Scanning of slide would be completed. Calculation, tables, plotting of graphs, micro photograph, writing other paper work will be done in the due course of time.

REFERENCES

Abd. El-Rahim M.A. El-Samawaty, Mohamed A. Yassin, Mohamed A. Moslem and Moawad R. Omar. (2013). Effectiveness of Some Plant Extracts against *Fusarium* spp. Causing Cotton Seedlings Damping-off. Life Science Journal 10(4): 510-515.

Alade, P. I. and Irobi, O. N. (1993). Antimicrobial activities of crude leaf extracts of ***Acalypha willkesiana***. J.of Ethnopharmacology39:171-174.

Ashwini C. and Giri G.K. (2014). Control of seed borne fungi in Green Gram and Black Gram through bioagents. International Journal of Applied Biology and pharmaceutical Technology. 5(3): 168-170.

Baker, R. and Chet, I. (1981). Isolation and biocontrol potential of ***Trichoderma hamatum*** from soil naturally suppressive to ***Rhizoctonia solani***. Phytopathology 71 : 286 – 290.

Bandyopadhay Sekhar (2001). Some studies on ***Trichoderma*** as a biocontrol agent. M.Sc. Thesis Plant Pathology, J N K V V, Jabalpur.

Bhajbhuje MN. (2014). Seasonal diversity of seed borne micro-fungal flora in storage on ***Solanum melongena L.*** Int. J. of Life Sciences. 2(1): 31-43.

Bhale, U.N., Kamble, S.S. and Gangawane, L.V. (2005). Effect of plant extract on growth and spore germination in ***Fusarium oxysporum f. spinaciae*** causing wilt of Spinach. Bioinfolet 2 (2) : 122 – 125.

Choudhary C. S., Jain S. C., Ritesh Kumar and Jaipal Singh Choudhary. (2013). Efficacy of different fungicides, biocides and botanical extract seed treatment for controlling seed-borne ***colletotrichum sp.*** in chilli (***Capsicum Annuum L.***). The Bioscan. 8(1): 123-126.

Debnath M., Sultana A. and Rashid A. Q. M. B. (2012). Effect of Seed-borne Fungi on the Germinating Seeds and their Bio-control in Maize. J. Environ. Sci. & Natural Resources, 5(1): 117–120.

Deepak Kumar, Srivastava and Heeralal Yadav (2008). Antifungal activity of some medicinal plants against ***Fusarium oxysporum***. Indian Phytopath. 61(1): 99 – 102.

Desai Thakur, R.T., Rao, V.P. and Anjaiah, V. (2000). Characterization of isolates of ***Trichoderma*** for biocontrol potential against ***Aspergillus flavus*** infection in Groundnut. International Arachis. Newsletter 20 : 57 – 59.

Embaby E.M. and Mona M. Abdel-Galil. (2006). Seed Borne Fungi and Mycotoxins Associated with Some Legume Seeds in Egypt. Journal of Applied Sciences Research, 2(11): 1064-1071.

Kamble and Bhale (2001). observed antifungal activity of plant extracts against *Fusarium udum* the incitant of Pigeon pea wilt.

Kiran and Raveesha (2002). observed antifungal activity of *Psoralea corylifolia* against important phytopathogenic species of *fusarium* and *Aspergillus*.

Javed and Charaya (2003). studied efficacy of leaf extract of certain plants against *Colletotrichum capsici*.

Kulkarni et al. (2004). Evaluated botanicals and biocontrol agents against *Alternaria alternata.*

Piyali Guha et al. (2005). studied antifungal activity of the crude extracts and extracted phenols from gametophyte and sporophytes of two species of *Adiantum*

Satish et al. (2007). Antifungal activity of some plant extracts against important seed borne pathogens of *Aspergillus* sp.

Deepak et al. (2008). Revealed antifungal activity of some medicinal plants against *Fusarium oxysporum*.

Rathod et al. (2010). studied utilization of medicinal plants to control seed borne pathogens of selected legumes seeds.

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Lakshmeesha et al. (2013). observed antifungal activity of some medicinal plants on Soybean seed-borne *Macrophomina phaseolina*.

ISTA (1976). International Rules of Seed Testing; Aneexes 1976. Seed Sci. & Technol. 4 : 3 – 49; pp 50 – 177.
Kakde Rajendra B., Pawar S. M., Badar K. V. and Chavan Ashok M. (2011). Fungitoxic properties of leaf extract and latex against storage fungi. Elixir Appl. Botany 41: 5944-5947.
Kamble, S.S. and Bhale, U.N. (2001). Antifungal activity of plant extracts against ***Fusarium udum***. The incitant of Pigeon pea wilt. J. of Sci. Dr. B.A.M.U. Aurangabad Vol. XXXI (8) : 39.
Kulkarni Srikant, Hegde Yashoda, R., Naik, K.S. and Patil R.V. (2004). In *vitro* evaluation of botanicals and biocontrol of agents against ***Alternaria alternata.*** National symposium on crop-surveillance : Disease for casting and management. 105.
Mali, V.P., Jamdhade, V.M. and Patale, S.S. (2008). Studies on seed mycoflora of Green gram and Black gram. Bionano frontierVol.1,Issue –2.
Najat Marraiki. (2013). Investigating the Effect of Aqueous Medicinal Leaf Extracts on Tomato Seed Quality. Biosciences Biotechnology Research Asia. 10(2), 843-847.
Nasreen Sultana and Ghaffar A. (2007). Seed borne fungi associated with Bitter Gourd (*momordica charantia linn.*). Pak. J. Bot., 39(6): 2121-2125.
Patekar M.A., Muley S.M., and Rathod L.R. (2013). Assessment of Seed borne fungi of some commercially important vegetable seeds. Recent Trends in Biological Sciences. 112-120.
Patekar M.A., Muley S.M., Padhi L. and Kanse D.S. (2011). Seed borne fungi of some vegetable seeds. National conference on Emerging Trends in biological and Information sciences. March 4-5. Swami Vivekanand Mahavidyalaya, Udgir, Dist: Latur (M.S.) India. 32-39.
Rathod L. R., Jadhav M.D., Awate M. K., Surywanshi A. M. and Deshmukh P.S. (2010). Utilization of medicinal plants to control seed borne pathogens of selected legumes seeds. International Journal of Advanced Biotechnology and Research. 1(2): 57-59.
Rathod L. R. and Pawar P. V. (2012). Antimicrobial activity of medicinal plant to control seed borne pathogen of soybean. Current Botany. 3(2): 10-12.
Sabry Y.M. Mahmoud, M.H. Hosseny, K.A.A. EL-Shaikh, Ali H.A. Obiadalla, and Mohamed Y.A. (2013). Seed borne fungal pathogens associated with common bean (***Phaseolus vulgaris L.***) seeds and their impact on germination. 11: 19-26.
Satish S., Mohana D.C., Raghavendra M. P. and Raveesha K.A. (2007). Antifungal activity of some plant extracts against important seed borne pathogens of ***Aspergillus sp.*** Journal of Agricultural Technology. 109-119.
Swami C S and Alane S K. (2013). Efficacy of some botanicals against seed - borne fungi of green gram (***Phaseolus aureus* roxb.**). Bioscience Discovery, 4(1):107-110.
Valeria Mancini and Gianfranco Romanazzi. (2013). Seed treatments to control seedborne fungal pathogens of vegetable crops. 70(6): 860-868.

Research student **Research Guide**

Ms. PATIL MINAXI VINAYAKRAO

Dr. RAJKUMAR GUNDAJIRAO BIRADAR
Assistant Professor
Sambhajirao Kendre Mahavidyalaya
Jalkot, Dist: Latur